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ABSTRACT

This program was designed to improve mathematics achievement by directing intervention toward diagnosed deficiencies in number concepts, computational skills, relationships among measures, and problem solving. Four hundred and twenty second through eighth grade students participated in the program. Math lab rooms were established in each of seven participating schools where students were seen in whole class and small group settings. Process evaluation was accomplished through a rating scale utilized by the evaluator during observation. Rating results indicated that the program functioned at an extremely high level with no ratings below the "fair" category. Quantitative evaluation was based on a pre/posttest design using the Stanford Diagnostic Mathematics Test. In all cases, on all grade levels, actual posttest means indicated significant gains in achievement and exceeded predicted posttest means. The report includes recommendations for future program implementation. (MK)

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FINAL EVALUATION REPORT

1978-79
District: #31

Project Title: Diagnostic-Prescriptive Program in Mathematics

Source of Funding: ESEA TITLE I Budget Code/Project No. 5095-91623

Prepared by: Dr. Micha el E. Knight

"Official Copy of this Evaluation, Approved as Corrected by the Community School Board President and/or the Community Superintendent, District 31 on October 19 ,1979."

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Community Superintendent

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EVALUATION OF TITLE I PROGRAM
COMMUNITY SCHOOL DISTRICT 31, NEW YORK CITY
1978-79 SCHOOL YEAR

FINAL REPORT

DIAGNOSTIC-PRESCRIPTIVE PROGRAM
IN MATHEMATICS

FUNCTION NO. 50 9591623

Prepared by: Dr. Michael E. Knight

I. INTRODUCTION

This program was designed to improve mathematics achievement by directing the intervention toward diagnosed deficiencies in number concepts, computational skills, relationships among measures and problem solving. These fall under the second priority established by the State Department of Education.

Seven schools identified in the project proposal participated in the program. Participants were selected on the basis of their performance on the fall 1978 Stanford Diagnostic Test. The seven schools participating in the program were: P.S. 14, P.S. 16, P.S. 18, P.S. 31, P.S. 44, J.H.S. 49, and P.S. 57.

Table I provides the enrollment of participants by grade level.

TABLE I

Enrollment in the Remediation Program in Mathematics

Grade	Enrollment
2	58
3	114
4	107
5	63
6	16
7	42
8	20
TOTAL	420

Mathematics laboratories equipped with the appropriate materials and equipment, were established in the seven schools participating in the program.

II. EVALUATION DESIGN

The quantitative objective of this program was to demonstrate statistically significant differences between the actual posttest score and the predicted posttest score, using a Correlated "t" Test. The Stanford Diagnostic Mathematics Test or the Metropolitan Mathematics Survey Test was used as the pretest and as the posttest, with appropriate levels being used for each grade level.

The primary qualitative evaluation was provided through observer ratings on a checklist designed for this program. A sample of the checklist and the results of its use are presented in Section IV.

The sample used for the evaluation consisted of the total number of participants in the seven schools who received both the pretest in October 1978 and the posttest in May 1979.

III. PROGRAM IMPLEMENTATION

Staffing

All positions in this program were filled by appropriately qualified personnel. Two of the schools included second graders in the program. Each of the seven schools had a Title I math teacher and an educational assistant.

Planning

Each school was asked to consult with its school based advisory committee and made recommendations for 1978-79 programs. These recommendations were submitted and discussed.

Interim Evaluation Reports were available and evaluation recommendations were also made. In addition, recommendations of teachers and project supervisors and coordinators were included in the planning.

ACTIVITIES

The Stanford Diagnostic Test and/or the Metropolitan Mathematics Survey Test was administered to each participant as a pretest to determine his level of competency prior to the implementation of the program. The specific needs of each participant in the program were identified by the administration of the diagnostic tests beginning in October 1978. Appropriate mathematics activities were prescribed based on the analysis of the diagnostic data. A student profile of mathematical concepts and skills was developed for each participant in the program. Diagnosis and prescription were on-going elements of the program. Each participant received a concentrated remediation program of at least 5 periods each week.

The specific mathematical experiences were provided using one or more of the following alternatives depending on the organization and facilities of each project site.

The mathematics resource teacher and the regular teacher jointly planned to provide the necessary experiences for the participants in the program.

The participants in the program operated in an open environment where they have the opportunity for contact with the mathematics resource teacher, the regular teacher, and other students.

In this way the remediation program became an intergrated part of the total mathematics program and the regular classroom teacher developed the

approaches and techniques demonstrated by the math resource teacher which can then be implemented in the regular tax levy math program.

1. Regular classes which contain eligible participants in the remediation program were scheduled into a Math Lab room. The Math Lab room was staffed by the math resource teacher and educational assistant. The regular teacher and the math resource teacher implemented the program using procedure described below.
2. Math Lab rooms were developed with activity centers for remeidation directed by the math resource teacher. Only those students who were remediation participants were scheduled at any time. Planning was done by the math resource teacher.

Functions of the Math Resource Teacher

Administer a diagnostic test to the participants and score it; prescribe appropriate mathematical experiences for each participant based on the analysis of the diagnostic data; record pre and posttest data and keep on-going records of the progress of each participant; plan follow-up and reinforcement activities with the regular classroom teacher; administer the posttest to the participants when appropriate; aid in training the regular classroom teachers in those approaches and techniques used in a mathematics laboratory; attend in-service training and sharing meetings to further enhance their level of competency in: mathematical content and concepts, uses of materials, laboratory approaches to remediation in mathematics; provide periodic reports to the principal of their school as to the progress of the participants; share with teachers, parents, and supervisors their experiences in the program at

faculty conferences and parent meetings.

Each of the above activities provided time each week for articulation between the math resource teacher and the regular teachers. Wherever possible regular teachers had a common period during which they could meet with the math resource teacher and discuss the progress of the program and the program participants and make the necessary adjustments in planning, scheduling, activities, materials, etc., to insure the maximum potential for the success of the program.

Whenever necessary, this time was also used to: provide additional remediation time for selected participants in the program; demonstrate an activity or use of material to the regular teacher; suggest to the regular teacher follow-up activities for the reinforcement of mathematics learned in the remediation but are not in the program, to share in the techniuqes and ideas used which are successful.

Functions of the Educational Assistant

The Educational Assistants, under the supervision of the classroom teacher, provided individual and very small group instruction to the participating children. She assisted the classroom teacher in maintenance of pupil records; attended training sessions and workshops; assisted in the preparation of instructional material (setting up) for the teacher; provided direct service to pupils in the classroom setting. All of the aforementioned activities were performed under the supervision of the Title I teacher and were carried out in a manner that "assists" the Title I teacher.

Supervisory

The Title I coordinator had overall responsibility for: informing principals of the program guidelines and distribution of copies of the proposal of principals and program coordinators; defining areas of implementation, evaluation procedures, record keeping, pupils rosters; meeting with coordinators of the program on a regular basis, making regular visits to all schools and all programs.

Instructional methodology for this component was the responsibility of the math supervisor. This is a tax levy position.

The math supervisor was responsible for: defining for the staff the philosophy, rationale, and origin of the program; providing and disseminating information about the program to principals, staff members, community organizations, etc.; providing on the job training to staff; assisting teachers in maintaining uniform attendance records, pupil profiles and progress charts, ordering program materials.

Function of the School Principal

The principal of each school participating in this program had primary responsibility for the supervision, administration and instructional details necessary for implementation of the program.

Staff Training

Each member of the staff had experience in Individualized Mathematics Programs. Planning and sharing meetings were conducted by the program coordinator. Objectives of these meetings included: classroom organization and

planning; refinement of record keeping devices - diagnosis and prescription; examination and discussion of the teacher's manual of Title I math activities developed in the district; discussion of program problems, i.e. scheduling, grouping, selecting appropriate activities, etc.; sharing successes and failures; broadening the scope of the program to include more problem solving and measurement; refinement of questioning skills; individualization and grouping; conversion pairing; exploration and discussion of new activities developed in the district.

Equipment, Materials, and Supplies

Physical materials such as unifix cubes, place value squared material, math balances measurement devices and SEE non-electronic calculators were used to provide physical models of math concepts and "hands on" experiences for participants. Other materials and supplies included teacher-made oak tag activities, graph paper, rexo, and activity cards used for practice and reinforcement of arithmetic skills. The D.P.A. Manual was an excellent source of materials and suggestions.

Problems Involved in Program Implementation

No problems have been observed in implementing the program.

Strengths of the Program

1. The consistent use of concrete materials with opportunities to test the use of skills and concepts in the abstract.
2. The ability of the personnel in the program to adapt their materials, techniques, and expectations when working with young children.

3. The use of prior learning as the basis for the development of new skills and concepts.
4. The clear communication to the children of high expectations of performance.

Weaknesses of the Program

1. Occasional use of whole group activities for extended periods.
2. A disproportionate amount of time in using games observed on a few occasions.
3. Influence on the regular math program could be expanded.
4. Greater use of modeling of math concepts should be encouraged.

IV. EVALUATION

Process Evaluation

This component of the evaluation used an observational rating scale which was based on the major goals of the program. (See Table II.) Examination of the ratings indicates that the program functioned at an extremely high level. There were no ratings below "fair" and the majority of rankings were in the "very good" or "excellent" categories. On 19 of the 20 items being rated over 50% of the ratings were in the "excellent" category. The process evaluation yields results which are clearly superior.

Product Evaluation

The quantitative analysis of this program was based on a pretest and posttest design. The participants were administered the Stanford Diagnostic

TABLE II

RATINGS OF THE DIAGNOSTIC/PRESCRIPTIVE PROGRAM IN MATHEMATICS

NUMBER OF OBSERVATIONS = 51	DISTRIBUTION OF RATINGS IN %				
	5	4	3	2	1
1. Suitability of available materials/equipment, direct instruction and independent activities.	66	26	8		
2. Availability of materials/equipment, direct instruction and independent activities.	64	20	16		
3. Sufficiency of materials/equipment, direct instruction and independent activities.	60	30	10		
4. Emphasis is on development of concepts and understanding.	58	26	16		
5. Experiences of children are drawn on.	52	30	18		
6. Nature of subject matter content suitable for children in this program.	72	24	4		
7. Concepts and learnings are related to other areas of the curriculum.	50	28	22		
8. Oral language and thinking are encouraged through questioning.	44	32	24		
9. Emotional climate.	76	18	6		
10. Independent groups and individuals are supervised.	72	20	8		
11. Activities appear well planned and organized.	64	32	4		

TABLE II - continued

		5	4	3	2	1
12.	Provisions are made for follow-up to provide continuity.	68	28	4		
13.	Attention given to individual children as well as to the total group.	68	28	4		
14.	Children participate actively in the lesson.	70	24	6		
15.	A variety of grouping procedures are used.	56	36	8		
16.	Independent activities are correlated with direct instruction in particular skill area.	52	36	12		
17.	Prescription is based on adequate diagnosis.	72	14	14		
18.	Record keeping is efficient and thorough.	66	32	2		
19.	A variety of learning modalities and experiences are used.	60	36	4		
20.	General rating or quality of activity observed.	62	30	8		

Scale: 5 = Excellent; 4 = Very Good; 3 = Fair; 2 = Poor; 1 = Very Poor

Mathematics Test in October 1978 and the same test was administered in May 1979. Correlated "t" Tests were used to predict posttest scores based on the students' previous achievement in mathematics and to compare these predictions with actual performance. In all of the cases statistical significance was achieved and in all cases the actual pretest was higher than the predicted posttest. During approximately seven months of treatment the smallest gain was 11 months and the average gain was greater than 14 months.

V. RECOMMENDATIONS

The following recommendations are submitted for consideration by the Community School District.

1. The program should be recycled.
2. The program should be extended within each school where it now exists, particularly in the lower grades. This recommendation would require additional funding in order to maintain current class sizes.
3. Visitations should be made by the staff to schools which have adopted this program.
4. Continued emphasis should be placed on providing an attractive, supportive learning environment.
5. Articulation between the classroom teacher and the math resource teacher should be improved through scheduling procedures which allow them common preparation times or through the procedure that each principal designates within their building. Consideration could be given to reorganizing the program with the D.P.A. teacher working

in the regular classroom.

6. Children should be involved in the selection of learning activities when possible in order to seek higher levels of independence.
7. Continued emphasis should be placed on the use of concrete materials for modeling mathematical concepts by the teacher and for manipulation by the children.
8. Attention should be directed toward the time children spend working on their tasks.
9. Consideration should be given to extending the goals of the program.
10. The percentage of time spent using games should be examined in a few situations to determine time-on-task in addition to their effectiveness in reinforcing concepts.

TABLE III

Mean Pretest and Posttest Scores on the Stanford Diagnostic Arithmetic Test, and the Correlated "t" Test

Grade	N	Pretest Mean	Predicted Posttest	Posttest Mean	"t"
		Concepts Subtest			
2	52	1.00	1.51	2.31	3.25*
3	102	1.87	2.48	3.35	3.46*
4	95	2.67	3.32	4.47	4.58*
5	57	3.49	4.17	5.46	4.91*
6	14	3.70	4.38	6.37	5.72*
		Computation Subtest			
2	52	1.22	1.83	2.57	2.94*
3	102	1.95	2.62	3.68	4.31*
4	95	2.71	3.34	4.47	4.55*
5	57	3.63	4.41	5.58	4.63*
6	14	4.21	4.90	6.13	4.76*
		Problem Solving Subtest			
2	52	1.10	1.66	2.19	2.25*
3	102	1.76	2.35	2.96	2.66*
4	95	2.52	3.19	3.75	2.47*
5	57	3.06	3.68	4.43	3.49*
6	14	4.12	4.86	6.04	4.68*

*Significant at the .05 level

TABLE IV

Mean Pretest and Posttest Scores on the Metropolitan Mathematics Survey Test, and the Correlated "t" Test

Grade	N	Pretest Mean	Predicted Posttest	Posttest Mean	"t"
7	40	4.98	5.71	6.58	3.71*
8	18	5.19	5.83	6.64	3.52*